
Chapter 6

Drive (%DRV)

What Is in This Chapter?

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Description

Presentation

Drive function blocks **DRV** allow drive devices such as Altivar Speed Drives to be controlled by an M221 Logic Controller. For example:

- Control the speed of a motor managed by an ATV drive and update it continuously
- Monitor the status of the ATV drive and motor
- Manage errors detected in the ATV drive.

Communications take place over one of the following methods:

- Configuring one of the serial lines of the logic controller as a Modbus Serial I/O Scanner (*see Modicon M221, Logic Controller, Programming Guide*) using the Modbus RTU protocol.
- Configuring the Ethernet port as a Modbus TCP I/O Scanner.

In EcoStruxure Machine Expert - Basic, first add targeted ATV drive types to the Modbus Serial I/O Scanner or Modbus TCP I/O Scanner. This sets up predefined channels and initialization requests allowing data to be read from and written to specific registers on the ATV drive, including for example:

- **ETA** Status Word
- **ETI** Extended Status Word
- **RFRD** Output Velocity (RPM)
- **DP0** Error Code on Last Error
- **CMD** Control Word

Data transfer is carried out using Modbus request type **FC23 - Read/Write Multiple Registers**. This allows the program, for example, to read from the **ETA**, **ETI**, and **DP0** registers and write to the **CMD** register with a single Modbus request.

The following single-axis Drive function blocks are available in the **Programming** tab of EcoStruxure Machine Expert - Basic:

Function Block	Description
MC_Power_ATV (<i>see page 77</i>)	Enables or disables the power stage of a device.
MC_Jog_ATV (<i>see page 79</i>)	Starts the Jog operating mode on a device.
MC_MoveVel_ATV (<i>see page 82</i>)	Specifies a target velocity for a device.
MC_Stop_ATV (<i>see page 85</i>)	Stops the current movement on a device.
MC_ReadStatus_ATV (<i>see page 87</i>)	Returns status information about a device.
MC_ReadMotionState_ATV (<i>see page 90</i>)	Returns status information on the current movement of a device.
MC_Reset_ATV (<i>see page 93</i>)	Reset device error regarding the drive state (<i>see page 72</i>) and acknowledge MC_Power_ATV (<i>see page 77</i>) errors.

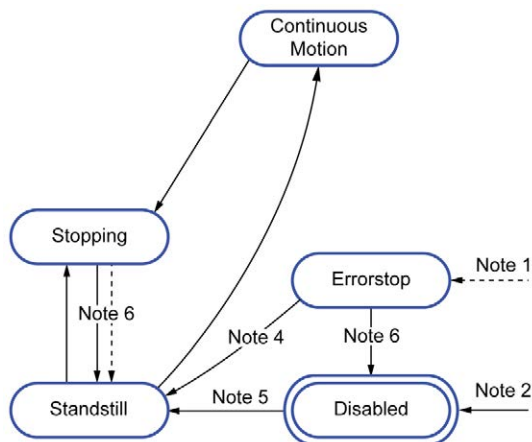
A maximum of 16 instances of each Drive function block can be used in a program at any one time.

When a device is added to the Modbus Serial I/O Scanner or Modbus TCP I/O Scanner, EcoStruxure Machine Expert - Basic allocates an axis for the device using a %DRV n object, where n is the number of the ATV drive. Each time you add a Drive function block to your program, you must associate it with an axis, creating a link between the function block, the axis, and the target device defined in the Modbus Serial I/O Scanner or Modbus TCP I/O Scanner.

Drive and Logic Controller States

Drive State Diagram

The drive is always in one of the states defined in the diagram below. When a Drive function block is executed or an error occurs, this may cause a state transition:



Note 1 From any state if an error occurs.

Note 2 From any state (if no ErrorAxis) when %MC_Power_ATV.status is 0.

Note 3 Transition from ErrorStop to Disabled state only if %MC_Reset_ATV.Done = 1 and %MC_Power_ATV.status = 0.

Note 4 Transition from ErrorStop to Standstill state only if %MC_Reset_ATV.Done = 1 and %MC_Power_ATV.Enable = 1 and %MC_Power_ATV.Status = 1.

Note 5 Transition from DISABLED to Standstill state only if %MC_Power_ATV.Enable = 1 and %MC_Power_ATV.Status = 1.

Note 6 Transition from Stopping to Standstill state only if %MC_Stop_ATV.Done = 1 and %MC_Stop_ATV.Execute = 0.

This table describes the drive states:

State	Description
Disabled	Initial state. The drive is not in an operational status or in an error status.
Standstill	The drive is in an operational status (ETA = 16#xx37) and Velocity = 0 (RFRD = 0).
ErrorStop	The drive is in an error status (ETA = 16#xxx8)
Continuous motion	The drive is in an operational status (ETA = 16#xx37) and Velocity ≠ 0 (RFRD ≠ 0).
Stopping	MC_Stop_ATV function block is executing.

The function block MC_ReadStatus_ATV (*see page 87*) can be used to read the status of the ATV drive.

Logic Controller State Transitions

The following table describes how the Drive function blocks are affected by changes in the logic controller state:

Logic Controller State	Impact on Drive Function Blocks
RUNNING	Drive function blocks are executed normally according to the user logic.
STOPPED	The configured drive axes are stopped when the controller goes into the STOPPED state, unless the Fallback Behavior option is set to Maintain values. If the Fallback Behavior option is set to Fallback values, the command 0x00 is sent to the ATV drive, which leads to a Switch on Disabled (NST) status. Otherwise, if Fallback Behavior is set to Maintain values, no action is taken (the command is not changed).
HALTED	The configured drive axes are stopped when the controller goes into the HALTED state, unless the Fallback Behavior option is set to Maintain values. If the Fallback Behavior option is set to Fallback values, the command 0x00 is sent to the ATV drive, which leads to a Switch on Disabled (NST) status. Otherwise, if Fallback Behavior is set to Maintain values, no action is taken (the command is not changed).
POWERLESS, EMPTY	Drive function blocks are not executed (the Modbus Serial IOScanner or Modbus TCP IOScanner is stopped). This is also the case when the application in the controller is updated.

NOTE: In the case of the controller state of HALTED or STOPPED, and you have selected to **Maintain values**, the drive is not given any further commands by the controller. Therefore, the drive must determine the appropriate state to assume. If you chose to **Maintain values** for the drive, you must include this in your hazard and risk analysis for any consequential and possibly hazardous events.

WARNING

UNINTENDED EQUIPMENT OPERATION

Ensure that a risk assessment is conducted and respected according to EN/ISO 12100 during the design of your machine.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Adding a Drive Function Block

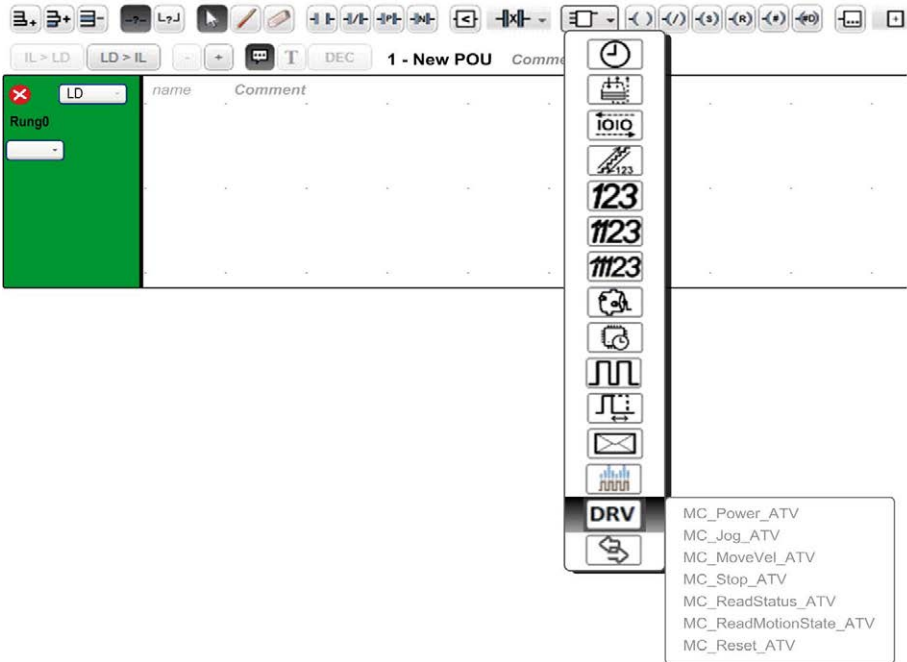
Prerequisites

Prerequisites to add a Drive function block:

- A Modbus Serial IOScanner or Modbus TCP IOScanner must be configured on a serial line or on Ethernet.
- The ATV drives to be controlled must be added and configured (*see Modicon M221, Logic Controller, Programming Guide*) on the Modbus Serial IOScanner or Modbus TCP IOScanner .

Adding a Drive Function Block

Follow these steps to add an instance of a Drive function block:

Step	Action
1	Select the Programming tab.
2	Select Function Blocks → Drive as shown in the following graphic: 
3	Click into the rung to place the selected function block.
4	Associate the inputs/outputs of the function block.

Removing a Function Block

Follow these steps to remove an instance of a Drive function block:

Step	Action
1	In the Programming tab, click the instance of the function block.
2	Press Delete to remove the selected function block.

Function Block Configuration

Configuring Drive Objects

Each Drive function block is associated with a Drive (%DRV) object. To display a list of configured Drive objects:

Step	Action																												
1	Select the Programming → Tools tab and click Drive objects → Drive to display Drive object properties. Drive properties <table><tr><th>Used</th><th>Address</th><th>Symbol</th><th>Comment</th></tr><tr><td>☒</td><td>%DRV0</td><td></td><td>ATV12</td></tr><tr><td>☐</td><td>%DRV1</td><td></td><td>ATV12_1</td></tr><tr><td>☐</td><td>%DRV2</td><td></td><td>ATV12_3</td></tr><tr><td>☐</td><td>%DRV3</td><td></td><td>ATV320</td></tr><tr><td>☐</td><td>%DRV4</td><td></td><td>ATV340</td></tr><tr><td>☐</td><td>%DRV5</td><td></td><td>Generic</td></tr></table> Apply Cancel	Used	Address	Symbol	Comment	☒	%DRV0		ATV12	☐	%DRV1		ATV12_1	☐	%DRV2		ATV12_3	☐	%DRV3		ATV320	☐	%DRV4		ATV340	☐	%DRV5		Generic
Used	Address	Symbol	Comment																										
☒	%DRV0		ATV12																										
☐	%DRV1		ATV12_1																										
☐	%DRV2		ATV12_3																										
☐	%DRV3		ATV320																										
☐	%DRV4		ATV340																										
☐	%DRV5		Generic																										
2	Update the properties as required and click Apply																												

Drive function blocks have the following properties:

Parameter	Editable	Value	Default Value	Description
Used	No	True/False	False	Indicates whether the Drive object is in use in the program.
Address	No	%DRVn	%DRVn	The address of the Drive object, where n is the object number.
Symbol	Yes	–	–	Allows you to specify a symbol to associate with the Drive object. Double-click the cell to define or edit a symbol.
Comment	Yes	–	–	Allows you to specify a comment to associate with the Drive object. Double-click the cell to define or edit a comment.

MC_Power_ATV: Enable/Disable Power Stage

Description

This function block enables or disables the drive power stage.

A rising edge of the input Enable enables the power stage. When the power stage is enabled, the output Status is set to 1.

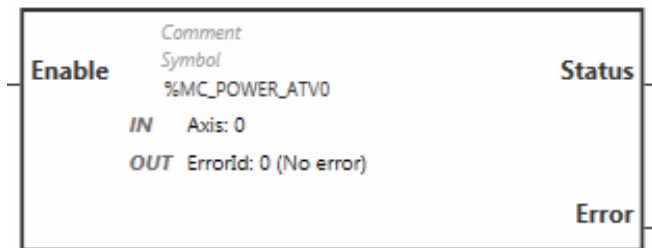
A falling edge of the input Enable disables the power stage (Shutdown command without Error). When the power stage is disabled, the output Status is reset to 0.

If the internal status register ETA of the ATV drive has not reached an operational status before the expiration of the timeout value, a Timeout Error is generated. The timeout is calculated as the channel cycle time multiplied by 4, or 10 seconds, whichever is greater. A minimum of 10 seconds is required to allow for drive reaction time.

If errors are detected during execution of the function block, the output Error is set to 1. This leads to a Shutdown command (CMD = 16#0006) to disable the ATV drive (Ready to switch on status, ETA = 16#xx21).

If an error occurs, only a successful execution of MC_Reset_ATV ([see page 93](#)) function block can restore the power stage.

Graphical Representation



Inputs

This table describes the inputs of the function block:

Label	Object	Initial value	Description
Enable	-	0	Set to 1 to start execution of the function block and enable the power stage. Set to 0 to stop execution of the function block and disable the power stage.
Axis	%MC_POWER_ATV <i>i</i> . <i>AXIS</i> where <i>i</i> is 0...15	-	Identifier of the axis (%DRV0...%DRV15) for which the function block is to be executed.

Outputs

This table describes the outputs of the function block:

Label	Object	Initial value	Value
Status	%MC_POWER_ATVi.STATUS where i is 0...15	0	Default value: 0 0: Power stage is disabled. 1: Power stage is enabled. Set to 1 when the ATV drive reaches an operational status (ETA = 16#xx37)
Error	%MC_POWER_ATVi.ERROR where i is 0...15	0	Set to 0 when no error is detected. Set to 1 if an error occurs during execution. Function block execution is finished. The ErrorId output object indicates the cause of the error.
ErrorId	%MC_POWER_ATVi.ERRORID where i is 0...15	0 (No error)	Error code returned by the function block when the Error output is set to 1. For details on the errors, refer to Error Codes (see page 95). Range: 0...65535

Parameters

Double-click the function block to display the function block parameters.

The MC_Power_ATV function block has the following parameters:

Parameter	Value	Description
Used	Address used	If selected, this address is currently in use in a program.
Address	%MC_Power_ATVi	The instance identifier, where i is from 0 to the number of objects available on this logic controller. For the maximum number of Drive objects, refer to the table Maximum Number of Objects (<i>see Modicon M221, Logic Controller, Programming Guide</i>).
Symbol	Symbol	The symbol associated with this object. For details, refer to Defining and Using Symbols (<i>see EcoStruxure Machine Expert - Basic, Operating Guide</i>).
Axis	%DRV _n , where n is 0...15 None	Select the axis (Drive object instance) for which the function block is to be executed. The Drive object must have been previously configured on the Modbus TCP IOScanner or Modbus Serial IOScanner (<i>see Modicon M221, Logic Controller, Programming Guide</i>).
Comment	Comment	An optional comment can be associated with this object. Double-click in the Comment column and type a comment.

Update the parameters as required and click **Apply**.

MC_Jog_ATV: Start Jog Mode

Description

This function block starts the Jog operating mode. A Jog operation commands a device to move forwards or backwards at a specified velocity.

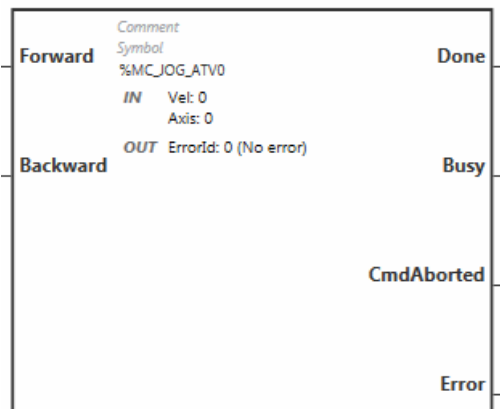
If either of the function blocks MC_MoveVel_ATV ([see page 82](#)) or MC_Stop_ATV ([see page 85](#)) is enabled while this function block is executing (Busy output set to 1), the MC_Jog_ATV function block commands the movement. The Busy output is reset to 0 and the CmdAborted output is set to 1.

When a Jog operation is in progress, a change of velocity value (Vel) is only applied on detection of a falling/rising edge of the Forward or Backward inputs.

If either of the Error or CmdAborted outputs is set to 1, the Forward and Backward inputs must first be reset to 0 and then a new rising edge applied to the Forward and/or Backward inputs to restart the movement.

Starting a Jog operation while the MC_Stop_ATV ([see page 85](#)) function block is executing causes a Stop Active Error. Starting a Jog operation when the drive is not in an operational status (ETA # 16#xx37) causes a Not Run Error.

Graphical Representation



Inputs

This table describes the inputs of the function block:

Input	Object	Initial Value	Description
Forward	-	0	Setting either the Forward input or the Backward input to 1 starts the jog movement. If the Forward and Backward inputs are both set to 1, the operating mode remains active, the jog movement is stopped, and the Busy output remains set to 1. If the Forward and Backward inputs are both set to 0, the operating mode is terminated and the Done output is set to 1 for one cycle.
Backward	-	0	
Vel	%MC_JOG_ATVi.VEL where i is 0...15	0	Target velocity for the Jog operating mode, in revolutions per minute (rpm). During jog movement, a change in the velocity value Vel is only applied upon detection of a falling/rising edge of the Forward or Backward input. Range: -32768...32767
Axis	%MC_JOG_ATVi.AXIS where i is 0...15	-	Identifier of the axis (%DRV0...%DRV15) for which the function block is to be executed. The axis must first be declared in the Configuration tab.

Outputs

This table describes the outputs of the function block:

Output	Output Object	Initial Value	Description
Done	%MC_JOG_ATVi.DONE	0	Set to 1 for one cycle when both the Forward and Backward inputs are set to 0. Set to 1 to indicate that the Jog operating mode is terminated.
Busy	%MC_JOG_ATVi.BUSY	0	Set to 1 when: • Jog is in progress (Forward = 1 or Backward = 1) • Both the Forward and Backward inputs are set to 1, indicating that the Jog operating mode remains active and the jog movement is stopped.
CmdAborted	%MC_JOG_ATVi.CMDABORTED	0	Set to 1 if function block execution terminates due to another command being executed.
Error	%MC_JOG_ATVi.ERROR	0	Set to 0 when no error is detected. Set to 1 if an error occurs during execution. Function block execution is finished. The ErrorId output object indicates the cause of the error.

Output	Output Object	Initial Value	Description
ErrorId	%MC_JOG_ATVi.ERRORID	0 (No error)	Error code returned by the function block when the Error output is set to 1. For details on the errors, refer to Error Codes (see page 95). Range: 0...65535

Parameters

Double-click the function block to display the function block parameters.

The MC_Jog_ATV function block has the following parameters:

Parameter	Value	Description
Used	Address used	If selected, this address is currently in use in a program.
Address	%MC_Jog_ATVi	The instance identifier, where i is from 0 to the number of objects available on this logic controller. For the maximum number of Drive objects, refer to the table Maximum Number of Objects (<i>see Modicon M221, Logic Controller, Programming Guide</i>).
Symbol	Symbol	The symbol associated with this object. For details, refer to Defining and Using Symbols (<i>see EcoStruxure Machine Expert - Basic, Operating Guide</i>).
Axis	%DRV _n , where n is 0...15 None	Select the axis (Drive object instance) for which the function block is to be executed. The Drive object must have been previously configured on the Modbus TCP IOScanner or Modbus Serial IOScanner (<i>see Modicon M221, Logic Controller, Programming Guide</i>).
Vel	Target velocity	Enter the target velocity for the Jog operating mode and press Enter. Default value: 0 Range: -32768...32767
Comment	Comment	An optional comment can be associated with this object. Double-click in the Comment column and type a comment.

Update the parameters as required and click **Apply**.

MC_MoveVel_ATV: Move at Specified Velocity

Description

This function block starts the Profile Velocity operating mode with a specified velocity. When the target velocity is reached, the InVel output is set to 1.

If the MC_Jog_ATV ([see page 79](#)) or MC_Stop_ATV ([see page 85](#)) function blocks are enabled while this function block is executing (Busy output set to 1), MC_MoveVel_ATV commands the movement. In this case, the Busy output is reset to 0 and the CmdAborted output is set to 1.

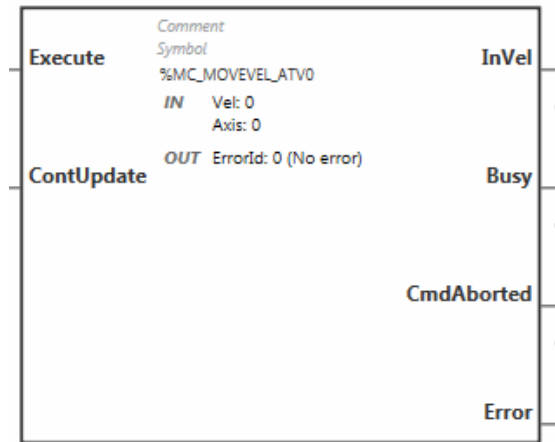
The ContUpdate and Vel input values are applied on a rising edge of the Execute input.

If either of the Error or CmdAborted outputs of MC_MoveVel_ATV is set to 1, a new rising edge of Execute is necessary to resume the movement.

Starting this function block while the MC_Stop_ATV ([see page 85](#)) function block is executing leads to a Stop Active Error.

Starting this function block when the drive is not in an operational status (ETA ≠ 16#xx37), leads to a Not Run Error.

Graphical Representation



Inputs

This table describes the inputs of the function block:

Input	Object	Initial Value	Description
Execute	-	0	Set to 1 to start execution of the function block.
ContUpdate	-	0	Set to 1 before executing the function block to enable continuous updating of the Vel parameter value.
Vel	%MC_MOVEVEL_ATVi.VEL where i is 0...15	0	Target velocity for the operating mode, in units of revolutions per minute (rpm). Range: -32 768...32 767. A negative value forces movement in the opposite direction.
Axis	%MC_MOVEVEL_ATVi.AXIS where i is 0...15	-	Identifier of the axis (%DRV0...%DRV15) for which the function block is to be executed. The axis must first be declared in the Configuration tab.

Outputs

This table describes the outputs of the function block:

Output	Object	Initial Value	Description
InVel	%MC_MOVEVEL_ATVi.INVEL	0	0 indicates that the target velocity (Vel) has not been reached. Set to 1 when the target velocity (Vel) is reached.
Busy	%MC_MOVEVEL_ATVi.BUSY	0	Set to 1 when the function block is executed. Remains at 1 even after the target velocity is reached. Reset to 0 when the function block is stopped or aborted.
CmdAborted	%MC_MOVEVEL_ATVi.CMDABORTED	0	Set to 1 if function block execution is terminated due to another command being executed.
Error	%MC_MOVEVEL_ATVi.ERROR	0	Set to 0 when no error is detected. Set to 1 if an error occurs during execution. Function block execution is finished. The ErrorId output object indicates the cause of the error.
ErrorId	%MC_MOVEVEL_ATVi.ERRORID	0 (No error)	Error code returned by the function block when the Error output is set to 1. For details on the errors, refer to Error Codes (see page 95). Range: 0...65535

NOTE: When the speed command of the ATV drive is low (< 10), the InVel and ConstantVel parameters may be invalid because the speed range of the ATV drive itself may be inaccurate.

Parameters

Double-click the function block to display the function block parameters.

The MC_Move1Vel_ATV function block has the following parameters:

Parameter	Value	Description
Used	Address used	If selected, this address is currently in use in a program.
Address	%MC_Move1Vel_ATVi	The instance identifier, where i is from 0 to the number of objects available on this logic controller. For the maximum number of Drive objects, refer to the table Maximum Number of Objects (<i>see Modicon M221, Logic Controller, Programming Guide</i>).
Symbol	Symbol	The symbol associated with this object. For details, refer to Defining and Using Symbols (<i>see EcoStruxure Machine Expert - Basic, Operating Guide</i>).
Axis	%DRV <i>n</i> , where n is 0...15 None	Select the axis (Drive object instance) for which the function block is to be executed. The Drive object must have been previously configured on the Modbus TCP IOScanner or Modbus Serial IOScanner (<i>see Modicon M221, Logic Controller, Programming Guide</i>).
Vel	Target velocity	Enter the target velocity for the operating mode and press Enter. Default value: 0 Range: -32768...32767. A negative value forces movement in the opposite direction.
Comment	Comment	An optional comment can be associated with this object. Double-click in the Comment column and type a comment.

Update the parameters as required and click **Apply**.

MC_Stop_ATV: Stop Movement

Description

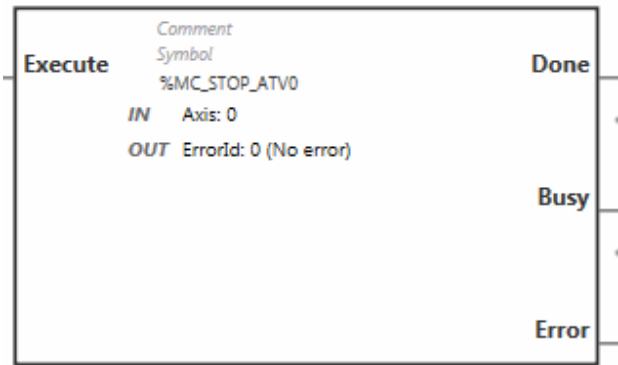
This function block stops the ongoing movement of the specified drive.

Drive-specific stop parameters, for example deceleration, are provided by the configuration of the drive.

Once started by a rising edge on the Execute input, any further activity on the Execute input is ignored until Done is set to TRUE. Executing another Drive function block while MC_Stop_ATV is busy does not abort the stop procedure—the function block MC_Stop_ATV remains busy and the other function block ends in an error.

The stop procedure can only be interrupted by disabling the power stage or if an error occurs (for example, ATV Not Run error or Modbus TCP IOScanner or Modbus Serial IOScanner error).

Graphical Representation



Inputs

This table describes the inputs of the function block:

Input	Object	Initial Value	Description
Execute	-	0	Set to 1 to start execution of the function block. The execution of other motion function block is not possible when the Busy output is set to 1. In this case, the other function block returns an error.
Axis	%MC_STOP_ATVi . AXIS where i is 0...15	-	Identifier of the axis (%DRV0...%DRV15) for which the function block is to be executed.

Outputs

This table describes the outputs of the function block:

Output	Output Object	Initial Value	Description
Done	%MC_STOP_ATVi.DONE	0	Set to 1 to indicate the function block execution is complete.
Busy	%MC_STOP_ATVi.BUSY	0	Set to 1 when function block execution begins.
Error	%MC_STOP_ATVi.ERROR	0	Set to 0 when no error is detected. Set to 1 if an error occurs during execution. Function block execution is finished. The ErrorId output object indicates the cause of the error.
ErrorId	%MC_STOP_ATVi.ERRORID	0 (No error)	Error code returned by the function block when the Error output is set to 1. For details on the errors, refer to Error Codes (see page 95). Range: 0...65535

Parameters

Double-click the function block to display the function block parameters.

The MC_Stop_ATV function block has the following parameters:

Parameter	Value	Description
Used	Address used	If selected, this address is currently in use in a program.
Address	%MC_Stop_ATVi	The instance identifier, where i is from 0 to the number of objects available on this logic controller. For the maximum number of Drive objects, refer to the table Maximum Number of Objects (<i>see Modicon M221, Logic Controller, Programming Guide</i>).
Symbol	Symbol	The symbol associated with this object. For details, refer to Defining and Using Symbols (<i>see EcoStruxure Machine Expert - Basic, Operating Guide</i>).
Axis	%DRV <i>n</i> , where n is 0...15 None	Select the axis (Drive object instance) for which the function block is to be executed. The Drive object must have been previously configured on the Modbus TCP IOScanner or Modbus Serial IOScanner (<i>see Modicon M221, Logic Controller, Programming Guide</i>).
Comment	Comment	An optional comment can be associated with this object. Double-click in the Comment column and type a comment.

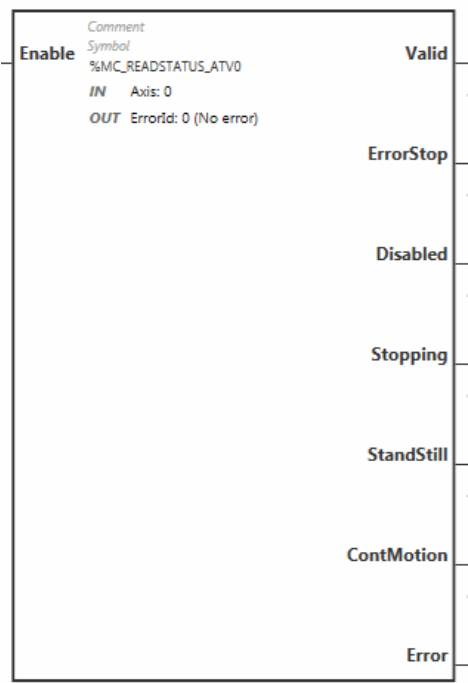
Update the parameters as required and click **Apply**.

MC_ReadStatus_ATV: Read Device Status

Description

The function block reads the status of the ATV drive.
Refer to Drive State Diagram ([see page 72](#)) for details on the states.

Graphical Representation



Inputs

This table describes the inputs of the function block:

Label	Object	Initial value	Description
Enable	-	0	Set to 1 to enable the function block.
Axis	%MC_READSTATUS_ATV <i>i</i> .AXIS where i is 0...15	-	Identifier of the axis (%DRV0...%DRV15) for which the function block is to be executed.

Outputs

This table describes the outputs of the function block:

Label	Object	Initial value	Description
Valid	%MC_ READSTATUS _ATVi.VALID	0	Set to 1 while the function block is running without errors.
ErrorStop	%MC_ READSTATUS _ATVi.ERRORSTOP	0	Set to 1 if the ATV drive is in an error status (ETA = 16#xxx8).
Disabled	%MC_ READSTATUS _ATVi.DISABLED	0	Set to 1 if the ATV drive is not in an operational status and not in an error status.
Stopping	%MC_ READSTATUS _ATVi.STOPPING	0	Set to 1 if the MC_Stop_ATV function block is being executed, or the movement is being stopped.
Standstill	%MC_ READSTATUS _ATVi.STANDSTILL	0	Set to 1 if the ATV drive is in an operational status and the velocity is 0 (ETA = 16#xx37 and RFRD = 0).
ContMotion	%MC_ READSTATUS _ATVi.CONTMOTION	0	Set to 1 if the ATV drive is in an operational status and the velocity is not equal to 0 (ETA = 16#xx37 and RFRD ≠ 0).
Error	%MC_ READSTATUS _ATVi.ERROR	0	Set to 0 when no error is detected. Set to 1 if an error occurs during execution. Function block execution is finished. The ErrorId output object indicates the cause of the error.
ErrorId	%MC_READSTATUS_ATVi.ERRORID	0 (No error)	Error code returned by the function block when the Error output is set to 1. For details on the errors, refer to Error Codes (see page 95). Range: 0...65535

Parameters

Double-click the function block to display the function block parameters.

The MC_ReadStatus_ATV function block has the following parameters:

Parameter	Value	Description
Used	Address used	If selected, this address is currently in use in a program.
Address	%MC_ReadStatus_ATVi	The instance identifier, where i is from 0 to the number of objects available on this logic controller. For the maximum number of Drive objects, refer to the table Maximum Number of Objects (see <i>Modicon M221, Logic Controller, Programming Guide</i>).
Symbol	Symbol	The symbol associated with this object. For details, refer to Defining and Using Symbols (see <i>EcoStruxure Machine Expert - Basic, Operating Guide</i>).
Axis	%DRV <i>n</i> , where n is 0...15 None	Select the axis (Drive object instance) for which the function block is to be executed. The Drive object must have been previously configured on the Modbus TCP IOScanner or Modbus Serial IOScanner (see <i>Modicon M221, Logic Controller, Programming Guide</i>).
Comment	Comment	An optional comment can be associated with this object. Double-click in the Comment column and type a comment.

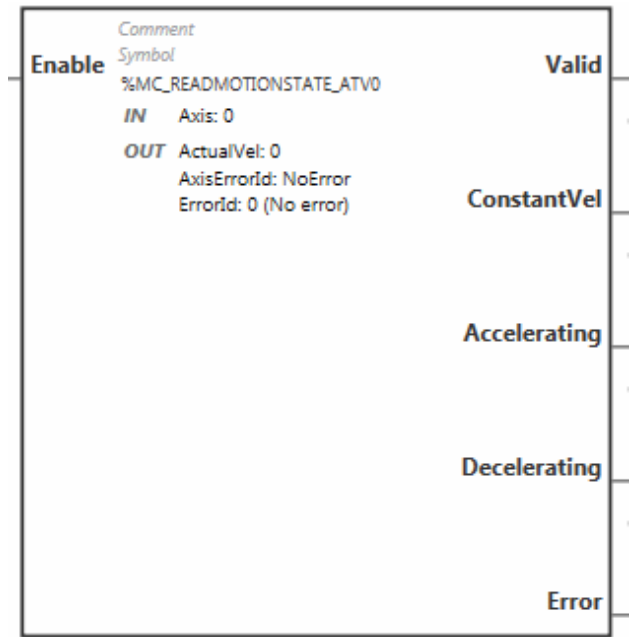
Update the parameters as required and click **Apply**.

MC_ReadMotionState_ATV: Read Motion State

Description

This function block outputs status information on the movement read from the ATV drive.

Graphical Representation



Inputs

This table describes the inputs of the function block:

Input	Object	Initial Value	Description
Enable	-	0	Set to 1 to start execution of the function block.
Axis	%MC_READMOTIONSTATE_ATV <i>i</i> . AXIS where <i>i</i> is 0...15	-	Identifier of the axis (%DRV0...%DRV15) for which the function block is to be executed.

Outputs

This table describes the outputs of the function block:

Output	Object	Initial Value	Description
Valid	%MC_ READMOTIONSTATE_ATVi.VALID	0	Set to 1 while the function block is running without errors.
ConstantVel	%MC_ READMOTIONSTATE_ATVi.CONSTANTVEL	0	Set to 1 when a movement at constant velocity is being performed (ETA register).
Accelerating	%MC_ READMOTIONSTATE_ATVi.ACCELERATING	0	Set to 1 when the motor is accelerating (ETI register).
Decelerating	%MC_ READMOTIONSTATE_ATVi.DECELERATING	0	Set to 1 when the motor is decelerating (ETI register).
Error	%MC_ READMOTIONSTATE_ATVi.ERROR	0	Set to 0 when no error is detected. Set to 1 if an error occurs during execution. Function block execution is finished. The ErrorId output object indicates the cause of the error.
ActualVel	%MC_READMOTIONSTATE_ATVi.ACTUALVEL	0	Velocity returned by the ATV drive (RFRD register). Range: -32768...32767
AxisErrorId	%MC_READMOTIONSTATE_ATVi.AXISERRORID	0	Axis error identifier returned by the ATV drive (DP0 register). There is an axis error when the drive is in an error status. Set to 0 if the drive is not in an error status (ETA register ≠ 16#xxx8) For details on axis errors, refer to AxisErrorId Error Codes (see page 95). Range: -32768...32767
ErrorId	%MC_READMOTIONSTATE_ATVi.ERRORID	No error (nOF)	Error code returned by the function block when the Error output is set to 1. For details on the errors, refer to Error Codes (see page 95). Range: 0...65535

NOTE: When the speed command of the ATV drive is low (< 10), the InVel and ConstantVel parameters may be invalid because the speed range of the ATV drive itself may be inaccurate.

Parameters

Double-click the function block to display the function block parameters.

The MC_ReadMotionState_ATV function block has the following parameters:

Parameter	Value	Description
Used	Address used	If selected, this address is currently in use in a program.
Address	%MC_ReadMotionState_ATVi	The instance identifier, where i is from 0 to the number of objects available on this logic controller. For the maximum number of Drive objects, refer to the table Maximum Number of Objects (<i>see Modicon M221, Logic Controller, Programming Guide</i>).
Symbol	Symbol	The symbol associated with this object. For details, refer to Defining and Using Symbols (<i>see EcoStruxure Machine Expert - Basic, Operating Guide</i>).
Axis	%DRV <i>n</i> , where n is 0...15 None	Select the axis (Drive object instance) for which the function block is to be executed. The Drive object must have been previously configured on the Modbus TCP IOScanner or Modbus Serial IOScanner (<i>see Modicon M221, Logic Controller, Programming Guide</i>).
Comment	Comment	An optional comment can be associated with this object. Double-click in the Comment column and type a comment.

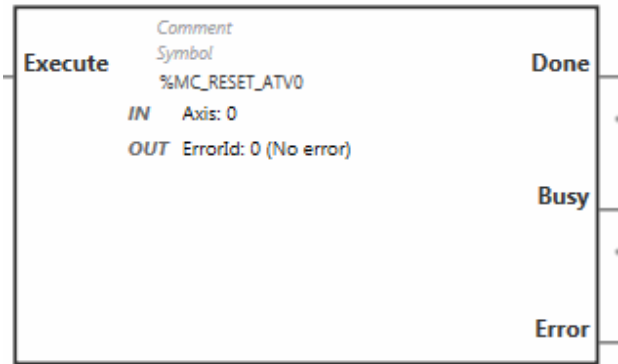
Update the parameters as required and click **Apply**.

MC_Reset_ATV: Acknowledge and Reset Error

Description

This function block is used to acknowledge an error and re-initialize the error condition on the drive. For more information, refer to Drive State Diagram ([see page 72](#)).

Graphical Representation



Inputs

This table describes the inputs of the function block:

Label	Object	Initial value	Description
Execute	-	0	Set to 1 to start execution of the function block.
Axis	%MC_RESET_ATVi.AXIS where i is 0...15	-	Identifier of the axis (%DRV0...%DRV15) for which the function block is to be executed.

Outputs

This table describes the outputs of the function block:

Output	Output Object	Initial Value	Description
Done	%MC_RESET_ATVi.DONE	0	Set to 1 when Reset has ended without error.
Busy	%MC_RESET_ATVi.BUSY	0	Set to 1 when the function block begins execution.
Error	%MC_RESET_ATVi.ERROR	0	Set to 1 if the device remains in an error status after timeout expiration. The timeout is calculated as the channel cycle time multiplied by 4, or 200 ms, whichever is greater. A minimum of 200 ms is required to allow for drive reaction time. Refer to Configuring Channels (<i>see Modicon M221, Logic Controller, Programming Guide</i>) for information on the configuring the channel cycle time.
ErrorId	%MC_RESET_ATVi.ERRORID	0 (No error)	Error code returned by the function block when the Error output is set to 1. For details on the errors, refer to Error Codes (<i>see page 95</i>). Range: 0...65535

Parameters

Double-click the function block to display the function block parameters.

The MC_Reset_ATV function block has the following parameters:

Parameter	Value	Description
Used	Address used	If selected, this address is currently in use in a program.
Address	%MC_Reset_ATVi	The instance identifier, where i is from 0 to the number of objects available on this logic controller. For the maximum number of Drive objects, refer to the table Maximum Number of Objects (<i>see Modicon M221, Logic Controller, Programming Guide</i>).
Symbol	Symbol	The symbol associated with this object. For details, refer to Defining and Using Symbols (<i>see EcoStruxure Machine Expert - Basic, Operating Guide</i>).
Axis	%DRVn, where n is 0...15 None	Select the axis (Drive object instance) for which the function block is to be executed. The Drive object must have been previously configured on the Modbus TCP I/O Scanner or Modbus Serial I/O Scanner (<i>see Modicon M221, Logic Controller, Programming Guide</i>).
Comment	Comment	An optional comment can be associated with this object. Double-click in the Comment column and type a comment.

Update the parameters as required and click **Apply**.

Error Codes

ErrorId Error Codes

This table lists the possible function block error codes:

Value	Name	Description
0	No error	No error detected.
1	IOScanner error	Error detected on IOScanner ⁽¹⁾ .
2	ATV is in an error status	The ATV drive is in an error status (ETA = 16#xxx8).
3	Timeout error	Timeout expired before the MC_Power_ATV function block has received the correct status from the drive.
4	Invalid ATV status	The ATV drive has an invalid ETA value.
5	Reset error	The MC_Reset_ATV function block is requested while the ATV drive is in an error status.
6	Stop Active error	The MC_Jog_ATV or MV_MoveVelocity_ATV function block is requested while MC_Stop is active.
7	ATV Not Run error	The MC_Jog_ATV or MV_MoveVelocity_ATV function block is requested while the ATV drive is not operational.
8	Invalid AxisRef error	AxisRef input %DRV of the function block is invalid (not present in the Modbus TCP IOScanner or Modbus Serial IOScanner configuration (<i>see Modicon M221, Logic Controller, Programming Guide</i>)).
9	Internal error	A firmware error occurred.

(1) Only for Modbus TCP IOScanner.
 If the %MC_Power_ATV function block raises an IOScanner error while the device is being scanned, it may be due to an overload on the Ethernet network. To identify the cause of the error, you can:

- Verify the IOScanner state: %SW212.
- Verify the drive state: %IWNS (300+x).
- Verify the channel state: %IWNS (300+x).y.
- Increase the **Response timeout** of the drive.

AxisErrorId Error Codes

This table lists the possible function block axis error codes returned by the MC_ReadMotion-Status function block:

Value	Name
0	No error (nOF)
2	EEPROM control (EEF1)
3	Incorrect configuration (CFF)
4	Invalid Configuration (CFI)
5	Modbus Comm Interruption (SLF1)
6	Internal Link Error (ILF)
7	Fieldbus Com Interrupt (CnF)
8	External Error (EPF1)
9	Overcurrent (OCF)
10	Precharge Capacitor (CrF)
13	AI2 4-20 mA loss (LFF2)
15	Input Overheating (IHF)
16	Drive Overheating (OHF)
17	Motor Overload (OLF)
18	DC Bus Overvoltage (ObF)
19	Supply Mains Overervoltage (OSF)
20	Single Output Phase Loss (OPF1)
21	Input phase loss (PHF)
22	Supply Mains Undervoltage (USF)
23	Motor Short Circuit (SCF1)
24	Motor Overspeed (SOF)
25	Autotuning Error
26	Internal Error 1 (InF1)
27	Internal Error 2 (InF2)
28	Internal Error 3 (InF3)
29	Internal Error 4 (InF4)
30	EEPROM ROM Power (EEF2)
32	Ground Short Circuit (SCF3)
33	Output Phase Loss (OPF2)
37	Internal Error (InF7)
38	Fieldbus Error (EPF2)

Value	Name
40	Internal Error 8 (InF8)
42	PC Com Interruption (SLF2)
45	HMI Com Interruption (SLF3)
51	Internal Error 9 (InF9)
52	Internal Error 10 (InFA)
53	Internal Error 11 (InFb)
54	IGBT Overheating (tJF)
55	IGBT Short Circuit (SCF4)
56	Motor Short Circuit (SCF5)
60	Internal Error 12 (InFC)
64	Input Contactor (LCF)
68	Internal Error 6 (InF6)
69	Internal Error 14 (InFE)
71	AI3 4-20mA Loss (LFF3)
72	AI4 4-20mA Loss (LFF4)
73	Boards Compatibility (HCF)
77	Conf Transfer Error (CFI2)
79	AI5 4-20mA Loss (LFF5)
99	Channel Switch Error (CSF)
100	Process Underload (ULF)
101	Process Overload (OLC)
105	Angle Error (ASF)
106	AI1 4-20mA Loss (LFF1)
107	Safety Function Error (SAFF)
110	AI2 Th Detected Error (tH2F)
111	AI2 Thermal Sensor Error (t2CF)
112	AI3 Th Detected Error (tH3F)
113	AI3 Thermal Sensor Error (t3CF)
114	Pump Cycle Start Error (PCPF)
119	Pump Low Flow Error (PLFF)
120	AI4 Th Detected Error (tH4F)
121	AI4 Thermal Sensor Error (t4CF)
122	AI5 Th Detected Error (tH5F)
123	AI5 Thermal Sensor Error (t5CF)

Value	Name
126	Dry Run Error (drYF)
127	PID Feedback Error (PFMF)
128	Program Loading Error (PGLF)
129	Program Running Error (PGrF)
130	Lead Pump Error (MPLF)
131	Low Level Error (LCLF)
132	High Level Error (LCHF)
142	Internal Error 16 (InFG)
143	Internal Error 17 (InFH)
144	Internal Error 0 (InF0)
146	Internal Error 13 (InFd)
149	Internal Error 21 (InFL)
151	Internal Error 15 (InFF)
152	Firmware Update Error (FEr)
153	Internal Error 22 (InFM)
154	Internal Error 25 (InFP)
155	Internal Error 20 (InF)
157	Internal Error 27 (InFr)